

# Knowledge and Perception about Clinical Research Shapes Behavior: Face to Face Survey in Korean General Public

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## INTRODUCTION

Along with the development of medical science, medical culture has evolved from empirical trial and error to an evidence-based model (1,2). With the aim of building on a secure scientific base, the clinical trial has become the gold standard for evaluating new treatment options (1,2), and data from such trials are compulsory worldwide for drug market access (3).

Although the United States have always been in the lead in terms of clinical research volume, some advances have been made in emerging countries, owing primarily to the growing interest of the pharmaceutical industry in globalization (4-7). Estimates vary presumably due to consulting different registries; however, previous research has confirmed a clear migration of clinical trials to Asia, with the greatest absolute increase occurring in the period 2005 to 2012 (8). Approximately thirty

thousand clinical trials conducted in Asian countries are registered in ClinicalTrials.gov, accounting for more than 17% of the total (9). It has been suggested that this shift to Asian countries is aimed at acquiring a larger patient pool to permit rapid enrollment, thereby saving time and money (6). Due to concerted efforts by the government, clinical trial volume in Korea has increased over the last decade, with Seoul being cited as one of the most active cities for clinical trials (4). To stimulate this process, the Korean Ministry of Health and Welfare established KoNECT (Korea National Enterprise for Clinical Trial), and a clinical trial infrastructure for new drug development was built around this national enterprise (4,10). Public awareness plays an essential role in shaping regulations, ethical standards, and the research environment (11,12), making it important to promote awareness not only among patients but also in the public at large. Despite a probable increase

Considering general public as potential patients, identifying factors that hinder public participation poses great importance, especially in a research environment where demands for clinical trial participants outpace the supply. Hence, the aim of this study was to evaluate knowledge and perception about clinical research in general public. A total of 400 Seoul residents with no previous experience of clinical trial participation were selected, as representative of population in Seoul in terms of age and sex. To minimize selection bias, every fifth passer-by was invited to interview, and if in a cluster, person on the very right side was asked. To ensure the uniform use of survey, written instructions have been added to the questionnaire. Followed by pilot test in 40 subjects, the survey was administered face-to-face in December 2014. To investigate how perception shapes behavior, we compared perception scores in those who expressed willingness to participate and those who did not. Remarkably higher percentage of responders stated that they have heard of clinical research, and knew someone who participated (both,  $P < 0.001$ ) compared to India. Yet, the percentage of responders expressed willingness to participate was 39.3%, a significantly lower rate than the result of the India (58.9% vs. 39.3%,  $P < 0.001$ ). Treatment benefit was the single most influential reason for participation, followed by financial gain. Concern about safety was the main reason for refusal, succeeded by fear and lack of trust. Public awareness and educational programs addressing these negative perceptions and lack of knowledge will be effective in enhancing public engaged in clinical research.

**Keywords:** Clinical Research Perception; Clinical Trial Participation; Perception of Clinical Trial; Awareness of Clinical Trial; Patient Enrollment

of interest in clinical trials, the catastrophic stem cell scandal in 2005 (13) and the constant reports of fraud committed by pharmaceutical companies (14), may create a false picture of clinical trials that creates distrust and promotes an image of investigators and sponsors as exploitative, which could encourage opposition to clinical trials.

A few studies have been published addressing the awareness and perception of clinical trials in Korea (15,16) yet none of the studies were conducted in the general population. Public awareness and advocacy campaigns have been shown to be effective tools for increasing public awareness and clinical trial participation (17,18). The PARTAKE survey described here is an early-stage approach to assessing public awareness and perception.

The PARTAKE survey was previously administered to 175 individuals in India (12), and our study replicates the survey in the Korean population. Its aim was to assess the level of public awareness and perception of clinical trials among the Korean public at large, using a validated survey tool.

## MATERIALS AND METHODS

### Survey instrument

The validity of the survey instrument was assessed by various methods, including review of the literature and consultation with experts (12). The instrument consists of 40 multiple choice and open-ended questions. It was forward translated into Korean and independently checked for clarity and meaning by two national experts, who are both fluent in English and Korean. The translation was subsequently back-translated into English and was confirmed to be equivalent to the original version. Written instructions have been added to the questionnaire to ensure its uniform use. To minimize selection bias, every fifth passer-by was invited to interview, and if in cluster, person on the very right side was asked. It was administered face-to-face in December 2014, and the detailed procedures employed were identical to those of the survey conducted in India (12).

### Subject selection

A proportional quota sampling method was used for subject enrollment; this is a standard tool for opinion polls, which allows subjects to be selected based on a range of demographic factors, and ensures that the sample interviewed is representative of the population of interest. The quota sampling was done using a predetermined proportion of mutually exclusive sets for age, sex and residence area. The proportion of subset, the quota, was determined by the demographic distribution of Seoul reported in the most recent census data (19).

### Sample size calculation

The sample size was calculated from the single proportions sample size formula using PASS 12 (NCSS, Kaysville, UT, USA). As-

suming fifty percent of the subjects understood the concept of clinical research, the sample size needed to achieve 5% precision and 95% confidence limits was computed. To compensate for potential non-responders, we planned to enroll a total of 400 subjects.

### Statistical analysis

Socio-demographics are summarized using descriptive statistics. The association between socio-demographic characteristics and clinical research perceptions were evaluated using the  $\chi^2$  test, Fisher's exact test or the independent *t*-test. The distribution of responses between comparing groups was tested using  $\chi^2$  goodness of fit. To assess the associations between clinical research perceptions and willingness to participate, perception scores were calculated for selected questions using defined standards, by assigning 1 point for each appropriate response. Differences in levels of public awareness and perception between India and Korea were compared with the  $\chi^2$  or independent *t*-test. There were no missing data. Statistical Software Package for Social Sciences (SPSS version 21.0; Chicago, IL, USA) was used for all statistical analyses, and the analysis was performed by an independent statistician.

### Ethics statement

Ethical review and informed consent were exempted by the institutional review board of Asan Medical Centre (IRB approval number: 2014-1061). Data were collected only from individuals who provided verbal informed consent and agreed to proceed. Written consent was not obtained since the survey was anonymous in order to provide access to as wide a public as possible.

**Table 1.** General characteristics of the participants

Criteria	No. (%) of subjects			P value*
	Heard (n = 306)	Not heard (n = 94)	Total (n = 400)	
Gender				0.244
Male	145 (47.4)	51 (54.3)	196 (49.0)	
Female	161 (52.6)	43 (45.7)	204 (51.0)	
Age (Mean $\pm$ SD), yr	41.0 $\pm$ 13.0	43.2 $\pm$ 16.1	41.5 $\pm$ 13.8	0.226
Education level				< 0.001
Less than high school	6 (2.0)	11 (11.7)	17 (4.3)	
High school	113 (36.9)	42 (44.7)	155 (38.8)	
College or more	187 (61.1)	41 (43.6)	228 (57.0)	
Monthly income <sup>†</sup>				0.443
No monthly income	112 (36.6)	39 (41.5)	151 (37.8)	
< 100	15 (4.9)	8 (8.5)	23 (5.8)	
100-199	59 (19.3)	20 (21.3)	79 (19.8)	
200-299	61 (19.9)	13 (13.8)	74 (18.5)	
300-399	24 (7.8)	7 (7.4)	31 (7.8)	
$\geq$ 400	35 (11.4)	7 (7.4)	42 (10.5)	
Employment				0.483
Employed	178 (58.2)	49 (52.1)	227 (56.8)	
Unemployed	18 (5.9)	8 (8.5)	26 (6.5)	
Others <sup>‡</sup>	110 (35.9)	37 (39.4)	147 (36.8)	

\*P value by  $\chi^2$  test or Student's *t*-test as appropriate; <sup>†</sup>Units are 10,000 KRW/month;

<sup>‡</sup>Others include housewives and students.

**Table 2.** Clinical research knowledge and perception in those who have heard and not heard about clinical research

No.	Questionnaire	No. (%) of subjects		
		Heard	Not heard	Total
Value (perceptions regarding the value that research brings)				
V1	Clinical research benefits society			
	True	242 (79.1)	73 (77.7)	315 (78.8)
	False	14 (4.6)	7 (7.4)	21 (5.3)
	Not aware	50 (16.3)	14 (14.9)	64 (16.0)
V2	Clinical research harms society			
	True	12 (3.9)	1 (1.1)	13 (3.3)
	False	263 (85.9)	80 (85.1)	343 (85.8)
	Not aware	31 (10.1)	13 (13.8)	44 (11.0)
V3	Clinical research is an essential step in developing new treatments			
	True	282 (92.2)	78 (83.0)	360 (90.0)
	False	11 (3.6)	6 (6.4)	17 (4.3)
	Not aware	13 (4.2)	10 (10.6)	23 (5.8)
V4	Hospitals that participate in clinical research provide better healthcare			
	True	103 (33.7)	39 (41.5)	142 (35.5)
	False	74 (24.2)	26 (27.7)	100 (25.0)
	Not aware	129 (42.2)	29 (30.9)	158 (39.5)
V5	Experiments on humans are essential to developing new treatments			
	True	246 (80.4)	64 (68.1)	310 (77.5)
	False	25 (8.2)	10 (10.6)	35 (8.8)
	Not aware	35 (11.4)	20 (21.3)	55 (13.8)
Motivation (perceptions regarding reasons for doing or participating in research)				
M1	The most important reason for developing new treatments is the advancement of science			
	True	232 (75.8)	72 (76.6)	304 (76.0)
	False	53 (17.3)	9 (9.6)	62 (15.5)
	Not aware	21 (6.9)	13 (13.8)	34 (8.5)
M2	The most important reason for developing new treatments is financial gain			
	True	99 (32.4)	31 (33.0)	130 (32.5)
	False	174 (56.9)	43 (45.7)	217 (54.3)
	Not aware	33 (10.8)	20 (21.3)	53 (13.3)
M3	Participation in research is entirely voluntary			
	True	189 (61.8)	52 (55.3)	241 (60.3)
	False	73 (23.9)	24 (25.5)	97 (24.3)
	Not aware	44 (14.4)	18 (19.1)	62 (15.5)
M4	Altruism is the only valid reason for participation in research			
	True	53 (17.3)	16 (17.0)	69 (17.3)
	False	186 (60.8)	48 (51.1)	234 (58.5)
	Not aware	67 (21.9)	30 (31.9)	97 (24.3)
M5	You have had an opportunity to participate in clinical research			
	True	38 (12.4)	5 (5.3)	43 (10.8)
	False	257 (84.0)	88 (93.6)	345 (86.3)
	Not aware	11 (3.6)	1 (1.1)	12 (3.0)
Compliance (perceptions regarding the conduct of research)				
C1	Volunteers in clinical research get adequate compensation for their participation			
	True	72 (23.5)	19 (20.2)	91 (22.8)
	False	48 (15.7)	15 (16.0)	63 (15.8)
	Not aware	186 (60.8)	60 (63.8)	246 (61.5)
C2	Participants in clinical research get adequate compensation for any adverse outcomes			
	True	56 (18.3)	21 (22.3)	77 (19.3)
	False	84 (27.5)	20 (21.3)	104 (26.0)
	Not aware	166 (54.2)	53 (56.4)	219 (54.8)
C3	Confidentiality of research participants is adequately protected			
	True	105 (34.3)	38 (40.4)	143 (35.8)
	False	46 (15.0)	13 (13.8)	59 (14.8)
	Not aware	155 (50.7)	43 (45.7)	198 (49.5)
C4	Volunteers in clinical research get adequate information about the research they participate in			
	True	108 (35.3)	29 (30.9)	137 (34.3)
	False	78 (25.5)	25 (26.6)	103 (25.8)
	Not aware	120 (39.2)	40 (42.6)	160 (40.0)

(Continued to the next page)

Table 2. Continued

No.	Questionnaire	No. (%) of subjects		
		Heard	Not heard	Total
C5	Researchers make sure research is safe for participants			
	True	143 (46.7)	38 (40.4)	181 (45.3)
	False	49 (16.0)	13 (13.8)	62 (15.5)
C6	Harmful events occurring during a clinical trial must be due to experimental treatment			
	True	138 (45.1)	36 (38.3)	174 (43.5)
	False	50 (16.3)	15 (16.0)	65 (16.3)
C7	The public should be involved in clinical research (e.g., design, oversight, funding)			
	True	160 (52.3)	46 (48.9)	206 (51.5)
	False	72 (23.5)	21 (22.3)	93 (23.3)
Trust (perceptions regarding trust of research entities)				
	T1 The government always adequately protects the public against unethical clinical research			
	True	65 (21.2)	20 (21.3)	85 (21.3)
T2	Clinical research information provided by pharmaceutical companies can be trusted			
	True	81 (26.5)	29 (30.9)	110 (27.5)
	False	102 (33.3)	29 (30.9)	131 (32.8)
T3	Clinical research information provided by academic institutions can be trusted			
	True	157 (51.3)	41 (43.6)	198 (49.5)
	False	52 (17.0)	17 (18.1)	69 (17.3)
T4	If you decide not to participate in research your doctor will not give you good care			
	True	29 (9.5)	13 (13.8)	42 (10.5)
	False	223 (72.9)	59 (62.8)	282 (70.5)
T5	Doctors force their patients to participate in research			
	True	31 (10.1)	7 (7.4)	38 (9.5)
	False	185 (60.5)	62 (66.0)	247 (61.8)
T6	Human participants in clinical research are treated like experimental animals ('human Guinea Pigs')			
	True	44 (14.4)	13 (13.8)	57 (14.3)
	False	150 (49.0)	47 (50.0)	197 (49.3)
T7	Confidentiality is a matter of importance to research participants			
	True	271 (88.6)	74 (78.7)	345 (86.3)
	False	26 (8.5)	10 (10.6)	36 (9.0)
T8	All the results of clinical research are made available to the public			
	True	37 (12.1)	17 (18.1)	54 (13.5)
	False	162 (52.9)	47 (50.0)	209 (52.3)
T9	The media accurately describes clinical research			
	True	52 (17.0)	25 (26.6)	77 (19.3)
	False	132 (43.1)	35 (37.2)	167 (41.8)
	Not aware	122 (39.9)	34 (36.2)	156 (39.0)

## RESULTS

### Subject characteristics

A total of 400 Seoul residents, aged between 20 and 69 years, with no previous experience of clinical trial participation responded to the survey. The validity of the survey was confirmed by the coherent responses to opposing questions. Of the respondents, 76.5% reported to have heard of clinical research. No mean-

ingful differences between those who had heard and those who had not heard about clinical research were observed with respect to gender, age, monthly income and employment status, but disparities in educational level were apparent (Table 1).

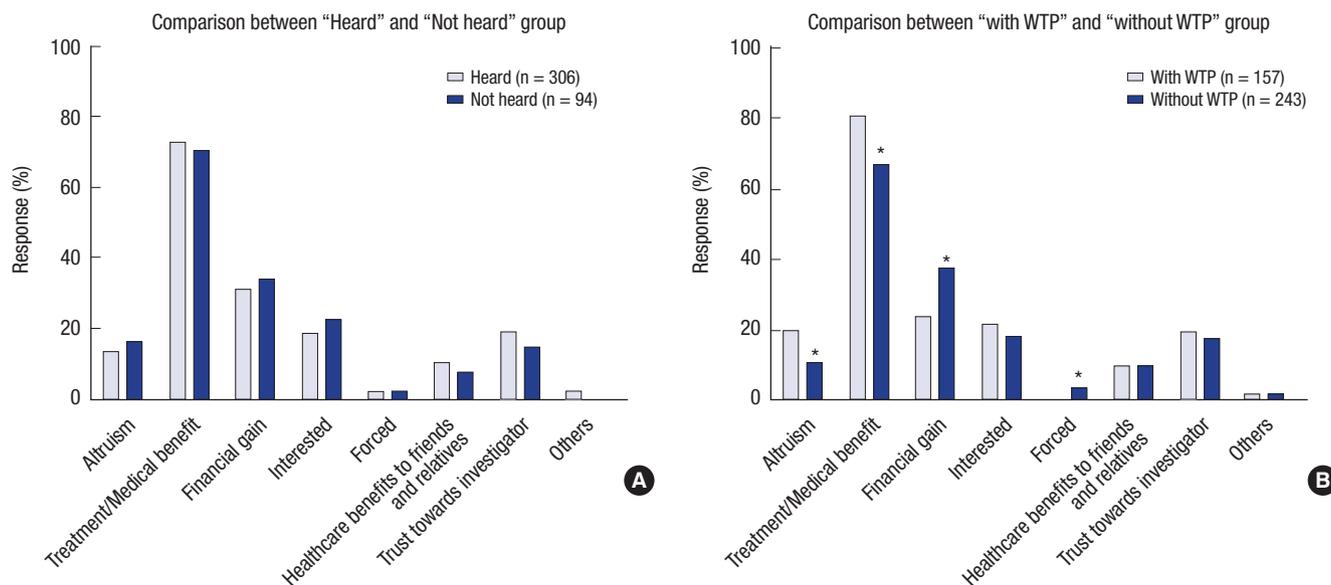
### Knowledge and perceptions of clinical research

Perceptions of clinical research were evaluated using 26 questions that were designed to assess perceptions in four different

**Table 3.** Difference between those who have heard and not heard about clinical research

Attitude parameters	Heard	Not heard	Total	P value*
Expressed willingness to participate, No. (%)	136 (44.4)	21 (22.3)	157 (39.3)	0.001
Trust perception score (mean ± SD)	2.36 ± 1.48	2.26 ± 1.61	2.33 ± 1.51	0.571
Ethics perception score (mean ± SD)	3.42 ± 1.42	3.39 ± 1.53	3.41 ± 1.44	0.900

\*P value by  $\chi^2$  test or Student's *t*-test as appropriate.



**Fig. 1.** Reason for participation (multiple responses). P value by  $\chi^2$  test or Fisher's exact test as appropriate. \*P < 0.05. WTP, willingness to participate.

categories. Each of the category is to see the perceptions of trust of the research entities, conduct of research, reasons for doing or participating in research and the value that research brings (Table 2). In the questions evaluating perceptions of the value of research, the distributions of responses to two of the five questions, V3 and V5, differed between the "heard" and the "not heard" group. The distributions of the responses to M1 and M2 were also discordant, whereas perceptions regarding the conduct of research were similar in the two groups. The distribution of response to all but one of the question appraising perceptions of trust in research entities also did not differ. The one exception was a question about confidentiality (T7).

Trust perception scores were calculated based on the responses to T1, T2, T3, T4, T9, and C5, as these questions were considered to be directly related to trust in research entities such as the government, pharmaceutical companies, academic institutions and investigators, and their advocacy groups. The ethics perception score was based on responses to M3, C3, C4, T5, T6, T7, T8, and T9, since these related to the ethical standards that research entities should maintain. No remarkable differences in trust and ethics perception scores were found between the "heard" and "not heard" groups (Table 3).

Further analysis of willingness to participate revealed a positive association with both perception scores in the "heard" group

**Table 4.** Difference in trust and ethic perception scores between those who expressed willingness to participate and those who have not

Category	Knowledge score (mean ± SD)	Expressed willingness to participate			
		Yes	No	Total	P value*
Total	Trust	2.76 ± 1.63	2.05 ± 1.35	2.33 ± 1.51	< 0.001
	Ethics	3.71 ± 1.37	3.21 ± 1.46	3.41 ± 1.44	< 0.001
Heard	Trust	2.76 ± 1.58	2.04 ± 1.31	2.36 ± 1.48	< 0.001
	Ethics	3.73 ± 1.38	3.16 ± 1.40	3.42 ± 1.42	< 0.001
Not heard	Trust	2.81 ± 1.97	2.10 ± 1.46	2.26 ± 1.61	0.073
	Ethics	3.62 ± 1.28	3.33 ± 1.59	3.39 ± 1.53	0.445

\*P value by Student's *t*-test.

but not in the "not heard" group (Table 4).

### Reasons for participation or refusal

No notable differences in the reasons given for clinical research participation were seen between the two groups (Fig. 1). The proportion of subjects who gave altruism, or treatment/medical benefits, as the reason for participation in clinical research was lower in the subjects not willing to participate than in those willing to participate, and financial gain, and being obliged to do so was higher among those not willing to participate. Treatment benefit was the single most influential reason for participation, followed by financial gain. The reasons for refusal were similar in the "heard" and "not heard" group, except for lack of

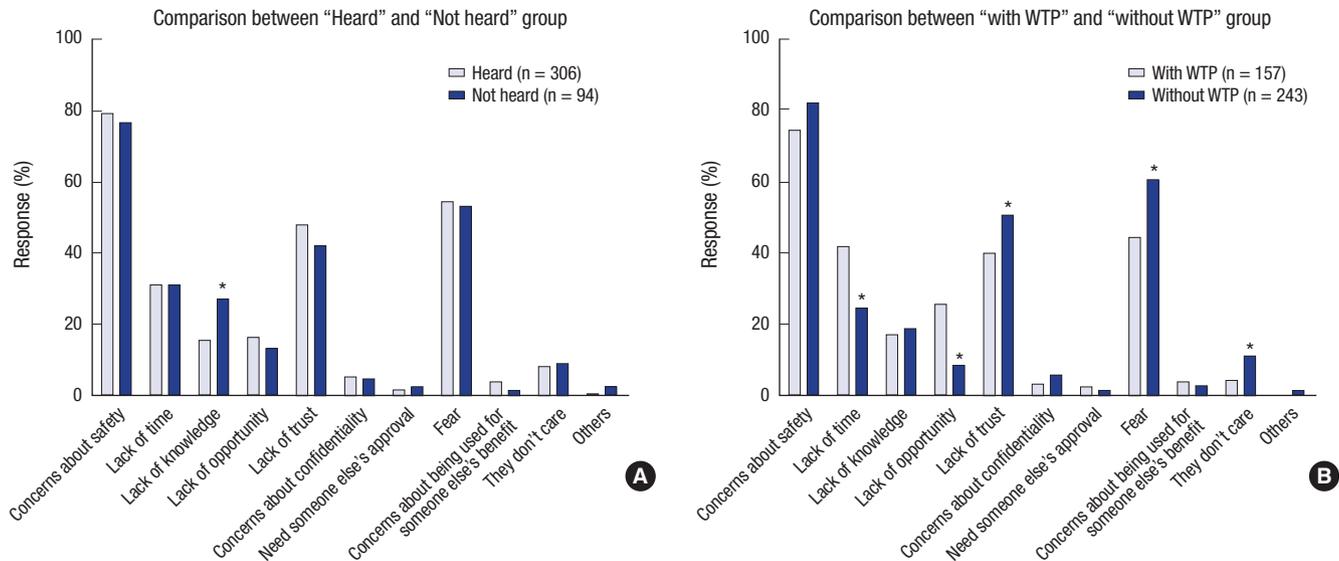


Fig. 2. Reason for refusal (multiple responses). P value by  $\chi^2$  test or Fisher's exact test as appropriate. \*P < 0.05. WTP, willingness to participate.

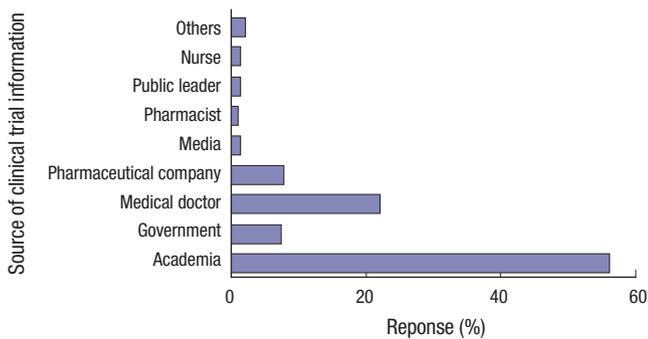


Fig. 3. Most trusted source of clinical research information.

knowledge (Fig. 2). The proportion of subjects who gave lack of time or lack of opportunity as the reason for refusal was lower among the “not willing” subjects while lack of trust, fear, and not caring were higher among these subjects. Thus, concerns about safety was the main reason for refusal, followed by fear and lack of trust.

**Sources of clinical research information**

The most trusted source of clinical research information was analysed. Academia was shown to be the single most trusted source, followed by medical doctors (Fig. 3).

**Differences between India and Korea**

Compared to the Indian experience, a much higher percentage of the respondents stated that they had heard of clinical research or knew someone who had participated. Nevertheless the percentage of responders expressing willingness to participate was only 39.3%, significantly lower than in India (Table 5).

Table 5. Comparison between India and Korea on exposure to clinical trial and willingness to participate

Participation attitude	India	Korea	P value*
Had heard of clinical research	26.3%	76.5%	< 0.001
Knew someone who participated	8.6%	17.0%	< 0.001
Expressed willingness to participate	58.9%	39.3%	< 0.001

\*P value by  $\chi^2$  goodness of fit tests.

**DISCUSSION**

The purpose of this survey was to evaluate levels of public awareness and perception of clinical research in the Korean public at large, focusing on non-participants in clinical trials. This is the first study to evaluate knowledge and perception about clinical research among Korean individuals without previous experience of clinical research participation, using a validated survey tool.

In general the survey participants had a positive view of clinical research (78.8%). The overwhelming majority of participants, greater than 76%, indicated that they had heard about clinical research. This figure agrees with an unpublished national report issued by the Korea Centers for Disease Control and Prevention (KCDC) in 2009, in which approximately 70% of the general public said that they had heard of clinical research (20). This speaks for the growing interest of the public in clinical research, as well as for the unique distribution of clinical research infrastructure in Korea, where most clinical research takes place in Seoul (21).

The proportion of subject expressed willingness to participate in clinical research was 39.3%, which is far below the rate in India (12). Although a number of explanations are possible, given that a large proportion of the subjects not willing to par-

ticipate gave a lack of trust, and fear, as reasons for refusal, a lack of belief in clinical research entities may have been primarily responsible for this result. According to a survey of the general public and patients, endorsed by CISCRP (The Center for Information & Study on Clinical Research Participation), the top two ranked sources of clinical research information are the internet and media (22). It is well known that the media are a primary source of information about what happens in the world, especially in those areas where direct access to information is not feasible (23). Since Korea is a country with one of the highest internet and smart phone penetrations (24), the relatively low proportion of responders expressing willingness to participate may be partly attributed to how the internet and media shape public perceptions and attitudes.

Although head-to-head comparisons may not be appropriate due to the different measurements used, there seems to be some relation between clinical trial awareness and willingness to participate, since two similarly designed studies among Korean cancer patients led to the same conclusions as our study (15,16). The study by Lee et al. (16) demonstrated that patients with previous experience of clinical trials expressed greater willingness to participate in future. Moreover the greater willingness to participate among patients who were aware of clinical trials in the study by Kim et al. (15) adds weight to the positive association between clinical trial awareness and willingness to participate. In line with this conclusion, we found that a higher percentage of the subjects in the “heard” group expressed a willingness to participate than in the “not heard” group.

To investigate how perception shapes behavior, we compared perception scores in those who expressed willingness to participate and those who did not. Both trust perception scores and ethics perception scores were shown to be related to willingness to participate. Surprisingly, these associations only existed in the “heard” group, and no notable correlation was observed in the “not heard” group. This raises the possibility that information about clinical research may not be regarded as meaningful unless the individual involved has already heard about clinical research.

Unlike India where altruism was the single most influential reason given for participation (12), treatment/medical benefit was the main reason for participation in clinical research in our study, and this is in agreement with studies performed in the patient population (15,16). Concern over safety was the main reason for refusal, and in line with this, subjects who answered yes to “Researchers make sure research is safe for participants” tended to express willingness to participate in clinical research. A similar conclusion was suggested in a previous study by the KCDC (20), where a lack of trust in government, the pharmaceutical industry, and researchers were noted. These findings imply a need for public awareness and educational programs to reverse negative perceptions of clinical research.

This study has several limitations. The respondents were all Seoul residents, and may not be representative of the awareness and perception of the Korean public in general. The results might have been more reliable if we had assessed in-depth knowledge about clinical research. Also, the comparison with India should be treated with caution, due to differences in demographic characteristics.

The majority of participant had a positive view of clinical research, and a substantial proportion of the respondents indicated that they had heard of clinical research. The results suggest that the main features of clinical research are well understood among the Korean public in terms of the research purpose, value, and the voluntary nature of participation. However, there was substantial distrust of clinical research. Public awareness and educational programs addressing these negative perceptions and lack of knowledge could be an effective tool in enhancing public engaged in clinical research.

## DISCLOSURE

No financial relationships with any organizations that might have an interest in the submitted work; no other relationships or activities that could appear to have influenced the submitted work.

## AUTHOR CONTRIBUTION

Study design: all authors. Acquisition of data: all authors. Statistical analysis and interpretation of data: Lee JS. Writing the draft: Choi YJ. Revision of manuscript: Kim TW, Beck SH, Kang WY, Yoo S, Kim SY, Burt T. Approval of the final version: all authors.

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## REFERENCES

1. Hussain-Gambles M, Atkin K, Leese B. South Asian participation in clinical trials: the views of lay people and health professionals. *Health Policy* 2006; 77: 149-65.
2. Rogers WA. Evidence based medicine and justice: a framework for looking at the impact of EBM upon vulnerable or disadvantaged groups. *J Med Ethics* 2004; 30: 141-5.
3. Lang T, Siribaddana S. Clinical trials have gone global: is this a good thing?

- PLoS Med* 2012; 9: e1001228.
4. George M, Selvarajan S, S SK, Dkhar SA, Chandrasekaran A. Globalization of clinical trials - where are we heading? *Curr Clin Pharmacol* 2013; 8: 115-23.
  5. Casas JP, Cubillos-Garzón LA, Morillo CA. Regional pathologies and globalization of clinical trials: has the time for regional trials arrived? *Circulation* 2003; 107: e194.
  6. Glickman SW, McHutchison JG, Peterson ED, Cairns CB, Harrington RA, Califf RM, Schulman KA. Ethical and scientific implications of the globalization of clinical research. *N Engl J Med* 2009; 360: 816-23.
  7. Thiers FA, Sinskey AJ, Berndt ER. Trends in the globalization of clinical trials. *Nat Rev Drug Discov* 2008; 7: 13-4.
  8. Drain PK, Robine M, Holmes KK, Bassett IV. Trial watch: global migration of clinical trials. *Nat Rev Drug Discov* 2014; 13: 166-7.
  9. ClinicalTrials.gov (US). See studies on map. Available at <https://clinicaltrials.gov/ct2/search/map> [accessed on 5 January 2015].
  10. Korea National Enterprise for Clinical Trials. Available at <http://www.kconnect.or.kr/> [accessed on 20 October 2014].
  11. Woolley M, Propst SM. Public attitudes and perceptions about health-related research. *JAMA* 2005; 294: 1380-4.
  12. Burt T, Dhillon S, Sharma P, Khan D, Mv D, Alam S, Jain S, Alapati B, Mittal S, Singh P. PARTAKE survey of public knowledge and perceptions of clinical research in India. *PLoS One* 2013; 8: e68666.
  13. van der Heyden MA, van de Ven T, Opthof T. Fraud and misconduct in science: the stem cell seduction: implications for the peer-review process. *Neth Heart J* 2009; 17: 25-9.
  14. Hvistendahl M. Drug development. Corruption and research fraud send big chill through big pharma in China. *Science* 2013; 341: 445-6.
  15. Kim JW, Kim SJ, Chung YH, Kwon JH, Lee HJ, Chung YJ, Kim YJ, Oh DY, Lee SH, Kim DW, et al. Cancer patients' awareness of clinical trials, perceptions on the benefit and willingness to participate: Korean perspectives. *Br J Cancer* 2008; 99: 1593-9.
  16. Lee SJ, Park LC, Lee J, Kim S, Choi MK, Hong JY, Park S, Maeng CH, Chang W, Kim YS, et al. Unique perception of clinical trials by Korean cancer patients. *BMC Cancer* 2012; 12: 594.
  17. Michaels M, Weiss ES, Guidry JA, Blakeney N, Swords L, Gibbs B, Yeun S, Rytönen B, Goodman R, Jarama SL, et al. "The promise of community-based advocacy and education efforts for increasing cancer clinical trials accrual". *J Cancer Educ* 2012; 27: 67-74.
  18. Mackenzie IS, Wei L, Rutherford D, Findlay EA, Saywood W, Campbell MK, Macdonald TM. Promoting public awareness of randomised clinical trials using the media: the 'Get Randomised' campaign. *Br J Clin Pharmacol* 2010; 69: 128-35.
  19. Seoul Metropolitan Government. Seoul statistics by category: population. Available at <http://english.seoul.go.kr/get-to-know-us/statistics-of-seoul/seoul-statistics-by-category/> [accessed on 20 October 2014].
  20. Korea Centers for Disease Control and Prevention. Attitudes and Perceptions of Clinical Trials in Public: Results from a Population-Based Survey [Unpublished Report]. Cheongwon: Korea Centers for Disease Control and Prevention, 2009, 1-4.
  21. Abbott D, Califf R, Morrison BW, Pierre C, Bolte J, Chakraborty S. Cycle time metrics for multisite clinical trials in the United States. *Ther Innov Regul Sci* 2013; 47: 152-60.
  22. The Center for Information and Study on Clinical Research Participation (US). 2013 International Survey on Public and Patient Attitudes about, and Experiences with, Clinical Research Studies [Unpublished Report]. Boston, MA: The Center for Information and Study on Clinical Research Participation, 2013.
  23. Happer C, Philo G. The role of the media in the construction of public belief and social change. *J Soc Polit Psychol* 2013; 1: 321-36.
  24. Kim H. Exercise rehabilitation for smartphone addiction. *J Exerc Rehabil* 2013; 9: 500-5.